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Spotlight

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“Smart” agricultural engineering

The digital transformation of our society is currently a “mega theme” in the media, as well as in public and political discussions. Agricultural digitization has found itself in an unexpectedly prominent position thereby. The idea of an “Agriculture 4.0” as companion to “Industry 4.0” has manoeuvred agriculture into the public interest – and to an extent that probably no agricultural engineer could have foreseen. Surprisingly, the term “Agriculture 4.0” is thereby not negatively seen, although it could have been associated, as analogue to “Industry 4.0”, with the negative image of factory-type farm mechanisation. In fact, not only agricultural engineers see “smart” digital agriculture as a great opportunity for producing food more efficiently and sustainably and, with that, creating the basis of food security for the growing world population and further increases in mankind’s prosperity.

But what does the development of a smart, digitized agriculture involve? Already nowadays, numerous software-based Farm Management Information Systems (FMIS) are applied to support farmer decision making. These will be further developed into farm management systems that do much more than simply inform. They can also make decisions autonomously, or prepare the decision making procedure to such an extent that the farmer, as a rule, need only monitor the process and give clearance for any action to be taken.

In other words, from decision support systems will be developed systems that to a great extent independently make the decisions required for the production process. With this, agricultural procedures will no longer be managed one by one, but instead all together within an integrated production system similar to an Industry 4.0 factory production procedure.

All production procedures and details will be comprehensively documented, and the collected information then becomes part of a networked food production process. One could describe this approach as intermeshed production. The upstream and downstream areas will naturally be just as involved in the information chain as the primary production on the farm. The suppliers to the agricultural processes will alter their products or services. For instance, with plant protection. Sold in this case will probably be the plant protection activities and materials involved plus an undertaking regarding their efficacy or the resultant yield. This would be instead of just the costs for the sprayer time and chemical input. The now awaited step-by-step appearance of 5G communication standards will drive this development onward. Becoming available will be information and communication technologies permitting, with higher band width communication and/or smallest latency periods, communication within cellular sub-networks - even if the eagerly awaited long-term hundred percent network coverage by our “telecommunication giants” is not to be expected in rural areas. This will enable

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highly-dynamic cloud control of machinery and processes and closed loop management of associated procedures: a further step towards networking of autonomous machinery and robots, whether they be large, as is the case so far, or, as many would wish, small. The opportunities presented by this trend are clear: from the consumer point of view, an increase in traceability within food production. Production can be more transparent and this can lead to an increase in consumer confidence in agriculture.

Automation, especially through autonomous machinery and robots, can compensate for the loss of available workers in rural areas. Higher performance density, lower energy consumption and reduction in chemical applications all have a positive effect on the environment. Additionally, value creation can be increased in rural areas through productivity increases.

Nevertheless, there are risks involved. For instance, we must solve questions and problems regarding data protection, the security of data and systems and the legal and technological aspects of data or information integrity. We also must ask ourselves whether digitizing agriculture is sufficient as key new technology to make agriculture and food competitive sectors for the future.

Will we, for instance, pay enough attention to the necessary ecological aims, especially in the area of climate protection? Or will further technologies be necessary? In whatever way these open questions are to be finally answered, one thing has already been achieved by digitizing agriculture i.e. the trend towards smarter farm mechanisation: agricultural engineering is once again cool!

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